

WHAT IS CLAIMED IS

1. A method for manufacturing a semiconductor device comprising the steps of;

- 5       forming a film to be processed on a substrate;  
      forming a mask material on the film to be processed;  
      forming a resist pattern on the mask material;  
      patterning the mask material using the resist pattern as a mask;  
      shrinking a patterned mask material;  
10       patterning the film to be processed using a shrunk mask material  
      as a mask; and  
      removing the shrunk mask material.

2. The method for manufacturing a semiconductor device  
15 according to claim 1,  
      wherein a metal film is formed as the mask material.

3. The method for manufacturing a semiconductor device  
according to claim 2,  
20       wherein a ruthenium film is formed as the mask material, and  
      the shrunk mask material is removed together with the resist  
      pattern using oxygen-containing plasma.

4. A method for manufacturing a semiconductor device comprising  
25 the steps of;  
      forming a film to be processed on a substrate;  
      forming a ruthenium film as a mask material on the film to be  
      processed;  
      forming a resist pattern on the mask material;  
30       patterning the mask material using the resist pattern as a mask;  
      patterning the film to be processed using a patterned mask  
      material as a mask; and

removing the patterned mask material.

5. The method for manufacturing a semiconductor device according to claim 4,

5 wherein the patterned mask material is removed together with the resist pattern using oxygen-containing plasma.

6. The method for manufacturing a semiconductor device according to claim 5,

10 wherein the patterned mask material is removed in the state that a metal material is exposed on the substrate.